REMARKS/ARGUMENTS

Claims 8, 12, 17 and 18 stand rejected under 35 U.S.C. Sec. 101 on the basis that the claimed invention is directed to non-statutory subject matter. The Examiner has alleged that the claims fail to produce a useful, concrete and tangible result for the reason that no result is stored, displayed or conveyed to the user. For the reasons set forth hereinafter, it is requested that the Examiner reconsider and withdraw this rejection.

It appears that the Examiner is alleging that the methods of Claims 8, 12, 17 and 18 are not directed to statutory subject matter because the claims do not recite an output. The Examiner does not appear to have presented a *prima facie* case for the rejections. The Examiner states that the claims fail to produce a useful, concrete and tangible result because no result is stored, displayed or conveyed to the user. However, it is not clear which useful, concrete or tangible result the Examiner considers that the present invention fails to meet. Furthermore, it is submitted that the Examiner should first show that the claimed invention falls within the Sec. 101 judicial exceptions. The claimed subject matter should not be classified as "a law of nature", "a natural phenomenon" or "an abstract idea with no practical application" merely because no output is explicitly claimed.

According to the guidelines indicated by the Examiner:

> *The examiner first shall review the claim and determine if it provides a transformation or reduction of an article to a different state or thing. If the examiner finds such a transformation or reduction, the examiner shall end the inquiry and find that the claim meets the statutory requirement of 35 U.S.C. Sec. 101.*

Claim 8 recites that "said step of applying a load to the battery serially connects the battery to a current load". Therefore claim 8 requires that the battery be put in a state of being

serially connected to a current load so that the state of the battery changes. Claims 12, 17 and 18 recite similar steps. The battery is not necessarily in the connected state throughout the other steps of the claim.

The claimed invention in Claims 8, 12, 17 and 18 produces a useful, concrete and tangible result for the following reasons:

1. The claimed invention diagnoses the state of a battery, and is therefore, useful. The claimed invention is clearly for a practical application.

2. The claimed invention produces a tangible result. The claimed invention diagnoses the state of a battery and therefore is not "abstract". According to the guidelines indicated by the Examiner *"the process claim must set forth a practical application of that Sec. 101 judicial exception to produce a real-world result"*. The claimed invention produces the real-world result of diagnosing the state of a battery.

3. The claimed invention produces a concrete result, since the claimed methods are essentially repeatable.

New claims 19-22 have been added to the application which depend from Claims 8, 12, 17 and 18, respectively, and all recite the outputting of the state of the battery diagnosed in the diagnosing step. The subject matter of these claims is supported in Figure 1 "Result of Diagnosis". New claims 19-22 are clearly allowable to Applicants.

Claims 1, 5, 6 stand rejected under 35 U.S.C. Sec. 102(e) as being anticipated by Kozlowski et al. (2003/0184307). In view of the Examiner's comments in the Office Action, it is assumed that this rejection also applies to claim 7.

Independent Claims 1 and 6

Independent claims 1 and 6 recite a diagnosing section diagnosing a state of the battery by applying a transient result obtained from the measurement to a mathematical expression obtained by a system identification method.

The Examiner contends that this feature is taught by Kozlowski. However, Kozlowski merely teaches impedance processing (Figure 1, element 14 of Kozlowski, as referred to by the Examiner). Kozlowski teaches taking wideband impedance data and outputting the impedance values to a feature vector (see Kozlowski paragraph [0056]). The feature vector is then used to fit the impedance data to an electrochemical model (see Kozlowski paragraph [0039]). Kozlowski does not teach or suggest that transient results are obtained from measurement and the obtained transient results are applied to a mathematical expression, as recited in claims 1 and 6. The use of transient results leads to more accurate results, as described in the specification.

It is noted that "transient" is a well known term in the electrical arts, and could be defined as a short-lived oscillation in the system, as caused by a sudden change of voltage or current or load, for example.

Independent Claims 5 and 7

Despite the previous arguments submitted by Applicants, the Examiner continues to maintain that the "fuel" of the battery can correspond with the "charge" of the battery. In a fuel battery, however, there is no concept of "charging". There is submitted herewith a Japanese language article, and an English language translation of the same, showing that "fuel" and "charge" are separate and distinct concepts. Since "charge" and "fuel" are not equivalents, the rejections of claims 5 and 7 should be withdrawn.

The Examiner asserts that Kozlowski's teaching for measuring battery properties during charging meets the limitation of applying a current to the battery when the battery is not supplied with fuel. According to the Examiners' definition of "charge" and "fuel"; the Examiner asserts that Kozlowski teaches measuring battery properties when the battery has no charge. However, Kozlowski merely teaches that properties are measured during charging. Kozlowski does not teach that the measurements are performed when the battery has no charge. There is no teaching or suggestion that the batteries are completely discharged before charging, and even if the batteries are completely discharged, there is no teaching that measurement is performed at a time when the battery is completely discharged.

Kozlowski's charging is a supply of charge to the battery. According to the Examiner's interpretation of "fuel" as "charge" (which Applicants disagree with), during charging fuel is supplied to the battery. Therefore, during charging the device of Kozlowski does not meet the claim limitation "when the battery is not applied with fuel", as recited in claims 5 and 7.

The Examiner has indicated that claims 13 and 14 would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims. These claims have been rewritten in independent form as new claims 23 and 24, respectively, and should now be allowable.

It is further noted that claims 4, 15 and 16 are allowed by the Examiner.

In view of the above amendments and remarks, it is submitted that all of the claims in the present application should now be allowable to Applicants, and formal allowance thereof is earnestly solicited.

Respectfully submitted,

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化学電池との違い

燃料電池には燃料が不可欠

■外部より絶えず燃料が供給される電池

燃料電池の基本原理は、これまでの乾電池（1次電池という）や蓄電池（2次電池という）などの「化学電池」と同じ原理によります（電池の基本原理は第2章を参照）。

違いは、反応物質の使用法にあります。

従来の化学電池は、反応物質が一定の容器に収容されているので、電流を取り出す（放電する）につれて消耗し、ついには電池を捨てるか、または外部から逆に電流を通じて充電しなければ、長く使うことはできません。

ところが燃料電池は、外部より絶えず燃料（水素。これを還元剤という）と、酸素または空気（これを酸化剤という）を供給して反応させるので、反応が理想的に行なわれると電池自身はなんらの変化をも受けずに、無限に電流を取り出すことができます。

したがって、燃料電池について化学的な言い方をすると、「外部より燃料（還元剤）と酸素または空気（酸化剤）を連続的に供給し、電気化学的に反応させて電気エネルギーを取り出す装置」ということになります（左図参照）。

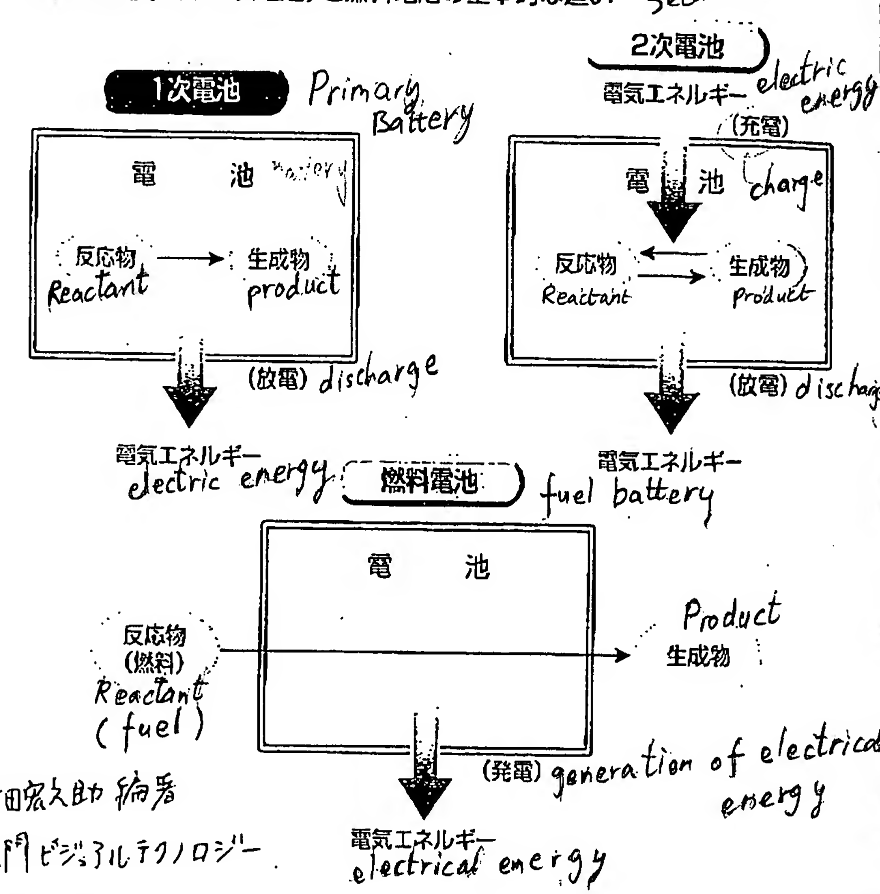
■燃料電池の特長はたくさんある

この燃料電池の発電システムは、従来の発電システムと比較して、次のような特長があります。

①発電効率が高く、エネルギーの有効利用がはかれる。
②電気と熱を同時に利用できるコージェネレーションシステム（熱電供給）が簡単に構築できる。
③大気汚染物質（NO_x、SO_x等）の排出量や騒音が少なく、地球環境に優しい。
④多様な燃料が使える（天然ガス、メタノール、ナフサ、石炭、ガソリン等）。
⑤小規模でも大規模発電に匹敵する効率が得られる。
⑥部分負荷においても全負荷（定格負荷）時なみの高い発電効率が得られる（部分負荷とは、使用機器がその時々に必要とする全負荷以下の負荷で、負荷率により発電効率が大きく変化しない）。
⑦モジュール（1つの機能単位）構成であり、建設期間の短縮がはかれ、設置場所の制約を受けない。

このように燃料電池発電システムは多くの魅力を持っているため、最近、地球環境に優しい電池、またエネルギー変換が経済的な電池として、各国で広く、精力的に研究開発が進められているのです。

■化学電池（1次、2次電池）と燃料電池の基本的な違い



池田宏之助 編著
「入門ビジュアルテクノロジー
燃料電池のすべて」
日本実業出版社 2001

1-3 Differences from chemical batteries

Sub-title: Fuel is essential for fuel battery

Battery constantly needing outside energy supply

Fuel batteries have the same basic principle as that of "chemical batteries" such as dry batteries (primary battery) and storage batteries (secondary battery) (see Chapter 2 for details of the basic principles of the batteries).

Differences between the batteries lie in methods of using reactant.

In conventional chemical batteries, since reactant is contained in a certain container, the batteries die as current is discharged. Eventually, the batteries need to be either disposed of, or, in order to be usable for a long period of time, charged by externally supplied current.

On the other hand, in fuel batteries, fuel (hydrogen, i.e., reductant) and oxygen or air (i.e., oxidant) are externally supplied constantly, so as to cause reaction. If the reaction occurs ideally, the batteries themselves are not affected by the reaction and current can be obtained unlimitedly.

Thus, in electrochemical terms, a fuel battery is defined as: *a device which continuously needs fuel (reductant) and oxygen or air (oxidant) as an external energy supply for electrochemical reaction to obtain electrical energy* (see figures on the left page).

Various characteristics of fuel batteries

Compared to conventional electrical generating systems, theses electrical generating systems using fuel batteries have the following characteristics:

(1) High power generation efficiency and efficient use of energy
(2) Cogeneration system (for supplying thermoelectricity) is easily constructed in which electricity and heat can be used at

the same time.

(3) Eco-friendly system: amount of emission of air contaminant (NOx, SOx etc.) and noise is less

(4) Various kinds of fuel are available (natural gas, methanol, naphtha, coal, gasoline etc.)

(5) High power efficiency equivalent to large-scale power generation, regardless of the small size

(6) Even at part load, high generating efficiency is achieved which is equivalent to the efficiency at full load (rated load). (Part load is not more than a full load required for a device at a time. Part load does not greatly vary depending on load factor.)

(7) Fuel battery is constituted by module(s) (unit for a signal function), constructed in a shortened time, and placed anywhere.

Due to such attractive characteristics, currently, fuel battery generating systems have been widely used in various countries, as an eco-friendly battery which can also convert energy economically. Further, research and development of the systems have been conducted strenuously.

Edited by Konosuke IKEDA, *"Introduction: Visual technologies of fuel batteries"*, Nippon Jitsugyo Publishing, 2001